INDEX TO THE TWENTY-NINTH VOLUME

OF THE

MINING JOURNAL.

Original Correspondence.

WORKING GOLD-BEARING STRATA.

SIR,—Alluvial deposits consist of disintegrated portions of adjacent rocks which have been mechanically and chemically treated in a multiplicity of ways by countless combinations of natural agencies. It is obvious that, wherever adjacent rocks contain minerals of commercial value, such as admit of being extracted therefrom by mechanical treatment, the alluvial deposits derived from such rocks must contain such minerals in a more concentrated and purer form, and in many instances easier of access and extraction. In the case of deposits derived from gold-bearing rocks, it may be said that the breaking, crushing, washing, &c., have already been performed for us to a great extent by Nature herself, so that, as your correspondent "B. N." (in No. 1268 of the Journal), justly remarks, it would be far more advantageous to work such alluvial deposits instead of operating upon the parent rock, or its rocks of secretion (quartz &c., veins). In gold-mining, as in mining generally, the secondary conditions of success (the principal conditions being, of course, the existence of the mineral sought for) depend very much on a careful analysis of all the features, geological and others, which the site of the respective deposit presents to the careful observer.

Although auriferous alluvial deposits are richer in metal generally than their auriferous parent rocks and their quartz veins, still it must be considered that quartz veins (which, again, are richer than their enclosing rock) in very many instances reach to the surface, so that they can at once be broken; that they can be traced with little trouble on the surface, that (their average yield having been ascertained by trial) they can be measured, the sum total of their yield be estimated by calculation, and the preliminary outlay be adjusted accordingly. In the case of auriferous alluvial deposits now we have, in the first place, by a very vigilant and scrupulous examination of the whole locality, to define the relation between such deposits and their parent rock, and in accordance therewith to define the spot, or spots, where we may expect to meet with the largest quantity of the precious metal, and there and then ascertain its existence by sinking for it. In drawn sections exhibiting gold-bearing strata we certainly see the auriferous seams tolerably well defined, but every gold miner will admit that the gold therein does not occur in a regular and uniform distribution, but that horizontally as well as vertically rich zones vary with poor ones, the principle of their occurrence having as yet not been clearly ascertained, and is not likely to be so until there are furnished correct statistics of the returns of all the workings in every locality, and as to under which circumstances such returns were obtained.

Although geology pretends, by authoritative theorising, founded on questionable reasoning, to know how granitic mountain masses, with their shistoze flanks, &c., were originally formed, still there does not even seem to exist a satisfactory definition of the formation of alluvial deposits, and we must be content to obtain the necessary data from chance—by digging here and there, &c., and then attempt to define as to in what manner and how much of the respective alluvial deposit has been derived from adjacent rocks, and how much from the disintegration of the rock *in situ*; for there occur many instances where the upper portion of rocks have been decomposed without being carried away; but where, nevertheless, such decomposed portions have assumed, in the course of time, an appearance of stratification, owing to the difference in specific gravity of their components, combined with percolation of water. Although, as a general rule, alluvial gold-washings are decidedly preferable to extracting the gold from quartz veins, still it remains a matter of calculation which would be preferable in certain particular cases. If we have the choice between working a quartz vein, or an alluvial deposit in its vicinity, we have to consider whether the expenses of quarrying and crushing the former, and of additional plant, are not superseded by the expenses of searching for and exploring the latter, and the additional expense for timbering and forking the water, &c., connected therewith—strike a balance, and of course prefer that mode which is the cheapest.

JULIUS.

SURVEYING IN MINES.

SIR,—In the Journal of Nov. 19 is an article on "Surveying in Mines," from which I gather that your mine surveys are conducted in rather a loose, unsatisfactory, and generally in an incorrect manner; and from the tenure of your article I infer it to apply equally to your lead, copper, and other mines, as the collieries. If those upon whom devolves the conducting of your mine surveys still adhere to the old method of surveying, or dialling, by means of the common surveyors' compass, for the purpose of obtaining the direction of the different parts of your mines—as, for instance, the workings of a colliery—then I must say they are lagging behind the age, and it is high time attention was called to the fact through the columns of your Journal.

Collieries in current operation cannot be without tramroads from the shaft in various directions to the face of the workings, for the transportation of the coal from the various parts of the mine to the shaft, and all modern roads for this purpose are of iron. It is well known to every individual accustomed to use surveying instruments that the magnetic needle is at all times under the influence of attraction when brought into close proximity of iron; it, therefore, follows that any survey made by means of a common compass in any headway, bord, or other passage along which a tramroad is laid, cannot be relied upon; neither is this the only cause of error in obtaining the courses of a mine survey by means of this instrument, the strata over and underlaying the coal seam very generally contain beds of iron, frequently within a short distance of the coal, the local attraction of which prevents the needle from setting on the true magnetic meridian. My own experience is, that the common surveyors' compass can only be looked upon as an instrument suitable to obtain, approximately, the position of workings in relation to boundary lines, or other objects on the surface, and ought never to be made use of where accuracy is required.

It may be necessary to inform your readers that we have the same difficulties to contend with in our collieries in Pennsylvania as you have in England, and we overcome the difficulty by making use of what we call an "engineer's transit;" this instrument has been in use here for many years, and I am surprised you have not adopted it in England long ago. I have made use of it in all my surveys where accuracy is required for the last six or seven years, and consider it unequalled for mine or any other surveys; a survey made by means of this instrument in the hands of a careful man can be relied upon. In general construction the "engineer's transit" is nearly the same as the English theodolite, excepting that the telescope of the transit is so placed in the standards as to reverse, or turn over, and thus look backwards and forwards, and prolong a straight line in both directions from any given point; while with the theodolite the telescope must be taken out of the supports, and turned end for end to obtain a back and forward sight from any given point, an operation attended with great risk in moving the instrument, and producing an error in the survey, besides being a clumsy and imperfect substitute for the reversal of the telescope of the transit. The transit is furnished with a compass-box, by means of which the true magnetic course of a base line is obtained—say, on the surface (from which all the surface surveys must also be made); this, or any other convenient line produced therefrom, is carried down the shaft, from which the surveys are continued through the workings in any required direction without the use of the magnetic needle. In the use of the transit we obtain by means of the telescope great precision in sighting at any point, and the Vernier scale enables the surveyor to read with ease and correctness the minute portions of any angle that one line of sight makes with another. The instrument is itself simple, and easily understood. For mining purposes, the "transits" made by Wm. J. Young, of Philadelphia, are the best.

You say—"Very little indeed has been done to assist the British miner in his vocation, whilst the press has teemed with publications for the benefit of the architect, the surveyor, and the mechanic, although the miners' profession is of no less importance." And, again—"whilst wonderful improvements have resulted from the introduction of scientific principles, it is to be deplored that the science of plane right-angled trigonometry has not been generally adopted in subterraneous surveying."

I have before me three works published in England on mine surveying; as to date of publication, they stand—1. *A Treatise on Subterraneous Surveying*, by Thomas Fenwick, published at Newcastle-upon-Tyne, 1804.—2. *The Practical Miners' Guide*, second edition, by J. Budge, published 1845.—3. The *Miners' Manual*, by Wm. Rickard, 1859. The first is by far the most complete treatise on mine surveying, by means of the common compass, yet published, old as it is; and yet Mr. Budge, in his preliminary chapter, says: "Nothing has ever yet been published with a design to assist the British miner in his subterraneous operations;" and, in another place, speaking of the first edition of his work, says: "As at that time no work was written on the subject, there was an excuse for the disastrous errors that took place then that does not now exist; and the mine agent who cannot now *prove* all his dialling operations before a single stroke has been struck, ought not to presume to make the attempt." Mr. Fenwick not only directs how a survey of a colliery or other mine shall be conducted, (and his method is much more simple and concise than either of the other authors) but he introduces the traverse table, commencing to explain the use thereof at page 25—"Of reducing bearings and distances to their northing or southing, and easting or westing, from the point of departure," and ending, page 85, by giving rules "to reduce any number of bearings and distances into one bearing and distance;" and he does this in so simple and easy a way, that any one can comprehend and use the tables, so far as the taking out of the latitudes and departures of a survey is concerned, without the slightest knowledge of trigonometry; indeed, I have men in my own office who can obtain the result of a survey by means of the traverse table, who know nothing of mathematics. Mr. Budge introduces tables into his work to find either of the three sides of a right-angled triangle, the angle and one side being given, to find the other two sides. His tables have one very serious objection—namely, the given side is always 1 fm. (6 ft.), while the primes, as he calls them, are in feet, inches, and decimals; thus, to take one of his own examples (draft 2, page 172) 5½° N. of E. (properly written N. 84° 30 E.), 12 fms. 1 ft. 6 inches (73.5 ft.); to find the northing he takes from his tables the prime or tabular for 5½°, which is 6·9 inches; this multiplied by 12¼ fms. gives 7 ft. 0·5 inches northing. The easting is obtained in a similar way; thus requiring a series of arithmetical calculations for every bearing and distance, a process very liable to mistakes, and a very clumsy method of obtaining the result of a survey by calculation. Traverse tables are now very common, calculated to every 15 minutes, and for any distance from 1 to 100; take one of those tables, and you have the result at once, without calculation (unless a survey is made by deflection angles, in which case the bearings and distances are obtained in degrees and minutes); thus, take the same example of Mr. Budge, N. 84° 30' E. 73·5 ft., and we have at once 7.36 ft. northing or latitude, and 73·13 ft. easting or departure. Mr. Rickard, in his *Miners' Manual* (page 164), explains the method of obtaining the base and perpendicular of a right-angled triangle by a table of natural sines and co-sines; this would be be all very well if his surveys were conducted so as to give the bearings in degrees and minutes, but if the survey is not so made, then the traverse table is by far the most expeditious as well as the most reliable, because involving fewer arithmetical calculations than either of the preceding methods. You make mention of Mr. J. P. Baker having prepared tables for the use of mine surveyors, by which the angle and hypothenuse of a right-angled triangle being given, corresponding lengths of the base and perpendicular are taken out of the tables in feet, inches, and tenths. I think the simpler tables of this kind can be constructed the better, and if Mr. Baker carries out his tables to the tenth of an *inch* (thus introducing a decimal fraction) he only makes them the more complicated. It is much easier for any one accustomed to take measurement, to divide the foot into tenths, and even hundredths, if required, in reading off distances, than in feet, inches, and tenths of an inch; and if we have our distances in feet and hundredths of a foot, or feet and decimal parts of a foot, we have them in a much simpler form, and much easier for future calculations.

You are mistaken when you say that by making proper use of the tables referred to "the surveyor is able to give mathematical proof of all his dialing operations;" so far as the survey itself goes it gives the result with greater accuracy than can be obtained by any other means; but if any error has been made in the survey, the same error is continued through the calculations. Thus, if I make a survey from the foot of a shaft through the various workings to the face of the coal, the calculations by means of the traverse table, prove whether the survey has been actually plotted on the map or surface, as the case may be; but it cannot prove or point out any inaccuracy of the survey. But if the colliery has two shafts, and the two are connected actually by surface survey, then any underground survey connecting the same two points must close if accurately made; that is, the sum of the northings will be equal to the sum of the southings, and the eastings to the sum of the westings; but such a survey cannot close if ran by a common compass; neither can it by use of the theodolite, as described by Mr. Rickard, page 183. The only instrument in use at all adapted for accurate surveys of mines is the "engineer's transit," in use here, which, combined with the trigonometrical calculations to obtain the result of such surveys, is certain to give accurate results.

GEORGE K. SMITH.

Pottsville, Schuylkill County, Pennsylvania, Dec. 12, 1859.

IMPROVEMENTS IN THE STEAM-ENGINE.—No. II.

SIR,—There is no mode of treating the effect of steam used expansively that for simplicity and practical utility is equal to defining the weight of the steam, and stating the practical efficiency of the so-defined weight by the average pressure such weight produces in practice upon the steam-piston. By this mode the practical efficiency of the different engines, with their diversified pressures and degrees of expansion, are at once reduced to a common standard, of as easy comprehension as the inches upon the foot rule. Not the least of the many recommendations of Professor Rankine's work on *The Steam-Engine* consists in assertaining by experiment the absolute practical evaporative efficiency of the various kinds of marine boilers, and giving the result of such practical experiments in the pounds weight of steam produced in each boiler by each 1 lb. of coal burned in the furnace; and in the same practical manner ascertaining the mean pressure upon the piston with marine engines, of from 226 to 744 horse power, in actual work, and thus reducing the mean pressure and pound of steam to a certain and simple mean practical effect, so as to form a true standard for all engines in their use of steam, and thus present a ready means for comparing the practical efficiency of using steam of any given pressure, degree of expansion, and perfection of vacuum.

It should be stated that the pressure, degree of expansion, and opposing pressure, on the exhaust side of the piston, and also the cut-off, are all taken by the indicator from the inside of the cylinder, so that the author is able to turn the engine inside out, as it were, and ascertain exactly the mean effective pressure upon the piston. He has also done what should never be neglected in double cylinder engines—taken the figures from both cylinders whilst in the act of using the same steam. The book, therefore, imparts real practical knowledge, and gives soundness to the practical conclusions relating to the generation and use of steam.

In my letter of last week, my reference to the above work was to example 2, pages 407 and 408, upon the use of steam, and example 9, p. 297, on its generation. I shall now refer to example 1, found at pages 405 and 406: in this example the evaporative efficiency of the boiler is given in connection with the use of the steam. All the details are amply given in the examples referred to. See, also, my letter in last week's Journal.

It is sufficient for all practical purposes, that from example 9 we find the boiler produces 13·56 lbs. of steam per lb. of coal; that from example 2 we find the steam so used that the consumption of coal is reduced by its better generation and use to 1·01 lb. per horse-power per hour. The full pressure is 106¼ lbs., cut off at 1-15th of the stroke; the vacuum resistance back on the piston is 3·65 lbs. per square inch, and the nett mean useful pressure is 21 lbs. per square inch of piston; the power is 226 indicated horse. Example 1, pages 405 and 406, shows the evaporative efficiency of the boiler to be 7·27 lbs. of steam for each 1 lb. of coal, and the full pressure 34 lbs. per square inch on the piston, the resisting pressure on the exhaust side being 4 lbs. per square inch; the steam was cut off a little earlier than 1-5th of the stroke, and the nett mean useful pressure is 13·10 lbs. per square inch of piston; the power 744 indicated horse, and the coal per indicated horse-power per hour is 2·97 lbs.

These are the engines made by Randolf and Elder, for the steamer *Admiral*; they are also double cylinder engines, and are classed first among the low-pressure marine engines; and in the use of the common marine boiler, of which, at page 409, we are told that it is ascertained by a number of recent experiments upon marine boilers of ordinary construction and proportions, with good ordinary steam coal, that they evaporate 7·24 lbs. of water per 1 lb. of coal. We see, therefore, that by a comparison of No. 1 and 2, that No. 2 produces within a fraction 3 times the useful power with 1 lb. of coal that example No. 1 is capable of producing at less than 3 lbs. of coal. In these two examples, illustrative of the practical use of steam expansively, there is very much deserving of notice; as by its more economical use in No. 2 than in No. 1, the same weight of steam is not only rendered 61 per cent. more effective, but although in Randolf and Elder's engine the steam is expanded down to nearly 2 lbs. pressure above the resistance from the condenser, or 6·117 lbs. absolute pressure per square inch, in example 2 it is not expanded quite so low, but the difference is so small as not to be worth notice. The point that is of moment is, that with the steam expanded to the same volume as in examples 1 and 2, there is in example 2, 61 per cent. increase of power from the same weight, and the same final volume of it, before it passes to the condensor; therefore it is quite clear that the same piston area gives also 61 per cent. more power than it can give in Randolf and Elder's, or any low-pressure engines.

Whoever will take the trouble to look back, will find formidable objections made to the increased piston area said to be required if the steam in marine engines were used expansively. At the time these objections were made the absolute pressure upon the piston in marine engines did not exceed 25 lbs. per square inch; this 25 lbs. pressure, used at full pressure through the whole length of stroke, would give 21 lbs. per square inch as the nett useful mean effect upon the piston. Or the power would be the same for the same area of piston as in example 2, but at the cost of nearly 4 times the weight of steam, and about 7 times the weight of coal per horse-power per hour. To reduce these practical results to their commercial value and national importance, let us suppose engines and boilers, such as example 2 and example 9, well made and well managed, and supplying the place of those in the *Great Eastern*. In the *Engineer* of Nov. 11, 1859, page 345, we are told that it is now certain the engines in this ship will not work up to anything like their power with 300 tons of coal per day but that 600 tons will be found nearer their daily consumption. From a leading article in the same Journal, of Oct. 14, 1859, page 281, we are informed that the aggregate indicated horse-power of screw and paddle engines, when working up to their full power, may be set down at 7900 horse. To get this power with any pressure that is not reckless with such boilers, we are under the mark if we put it at 4 lbs. of coal per horse-power per hour; as it will not be pretended that to get this power the steam can be cut off earlier than 6-10ths, unless the pressure be above 40 lbs. in the boilers. Now, with 4 lbs. of coal per horse, as compared with 1 lb. of coal per horse-power on 7900 horse, and supposing sixty days for the passage between England and Australia, we get the commercial relation.

In such case, by the economy of examples 2 and 9 (as referred to last week), there would be a saving of 15,210 tons of coal, and its freight, on each voyage. In a leading article in the *Engineer*, of Nov. 5, 1858, page 358, it it stated that every ton of coal saved in this voyage is equal to a gain of 9*l*.; the coal is set at 3*l*. per ton, and its freight at 6*l*. If this be correct, then the 15,210 tons of coals saved would be equal to a gain of 136,890*l*, per voyage, and on three voyages per year the gain would equal 410,670*l*. per annum. Supposing the engines to work up to their power, if the voyage took 90 days, the coal saved each voyage would be half as much again, and two voyages would represent the same gain as the three voyages at 60 days each.

At the time, or just before, the *Great Eastern* was first projected one of the then directors, and a scientific friend of his, called on me, and after examining and making all requisite enquiries respecting my engines, boilers, and condensers, and observing their working, they came to the conclusion that in them was presented that which they required (as I understood them) for their Australian steamers; and the director afterwards informed me that he had pressed the adoption of them at the meeting of directors but the engineer-in-chief would not listen to the proposal, alleging no other objection but the danger from the high-pressure steam. I have said years ago, and shall always maintain, that the party never could believe his own representations at the time he made them; and it is the most charitable conclusion, as to believe that he did is to attribute an amount of ignorance which is more disparaging still. So far are the boilers from being dangerous, that even had he been able to have exploded them with 200 lbs. pressure, no such destruction and loss of life could have taken place as has already occurred with a mere heater on the low-pressure practice. The very boilers so represented as dangerous will, at no distant day, reduce the hundreds of human lives as now sacrificed by boiler explosions to units. The safety of the system was so obvious, and the aversion to its use so great, as almost to make one believe that misery and destruction of human life were desired by the opposition parties to progress.

It was determined to have a great ship to neutralise heavy, bulky, and large coal-consuming engines, in preference to light, compact, but powerful engines, consuming only a fourth of the coal. These economical engines are adapted to the smallest and the largest vessels, the shortest or the longest voyages, and, in short, to all purposes on land or water. Before these things were placed among the accomplished facts, recollection reminds me how much they were desired, and how impossible they were considered; and what honour and reward were held out to anyone who should be able to bring together the practical means for effecting their accomplishment. Alas! how different have I found reality to such representations!

T. CRADDOCK.

CORE-BARS FOR CASTING.—Mr. Thomas Wight, of Middlesboro'-on-Tees, foundry manager, has just specified (per Mr. Campin, the patent agent) his patent for "Improvements in the Apparatus used in the Manufacture of Cast-metal Pipes and Castings, termed Core-bars, for Spindles and Chaplets," the object of which invention is the rendering more practical and generally useful core-bars of the expanding and contracting class used for casting pipes and cylindrical castings, &c. The specification embraces various practical improvements, and has two sheets of elaborate drawings annexed, which should be referred to in order to completely ascertain the nature and character of the invention; but the principal points of the patent appear to be these:—1. The constructing expanding core-bars of shell plates and longitudinal wedge bars of corresponding taper fitting together, and shaped so that the plates and bars shall together produce the required external form when drawn or driven up into the expanded position.—2. Also, the constructing the core-bars with a spindle, having a conical or other tapered surface, or having projections with conical or other tapered surface, fitting against corresponding tapered surfaces, either upon the shell plates, or upon snugs, wedge pieces, or blocks, cast, or formed upon, or affixed to them, for the purpose of producing the desired expansion of the shell plates, the which method of producing the expansion is claimed, not only when the shell plates are used in combination with longitudinal wedge bars as aforesaid, but also generally when used in combination with the modes of limiting the expansion hereafter mentioned and claimed.—3. The mode of limiting the expansion to the desired extent by the use of hoops made of iron, steel, or metals, or wires, or a combination of any of them, when applied externally to the shell plates, and either placed or not placed within recesses or grooves for keeping the core-bar firm when the shell plates are expanded.—4. Also, the construction of recesses or grooves externally, in or upon the shell plates, to admit the hoops or wires.—5. And, further, he claims the mode of limiting the expansion by the use of loose collars on the shaft, the collars carrying screw bolts or stops passing through the shell plates, and formed with heads or enlarged portions, made to fit and lie within corresponding countersunk recesses in the shell plates.—6. Lastly, he claims constructing chaplets for supporting or holding down in cores, in pipes, and other castings, with screwed studs or screwed portions, more effectually than heretofore, causing a proper adhesion or union of the cast metal with the chaplet, and for affording a better hold in the cast metal when rivetting nail chaplets.

BASTIER'S PATENT PUMP.—Raising water for domestic use by means of wells has the strongest claim to antiquity, and is remarkable for its extreme simplicity in principle, and absence of complexity in arrangement. In the patriarchal age it was the only means available, and no perceptible advance was made (with the exception of the Roman aqueduct) in this respect until the conclusion of the eighteenth and the commencement of the nineteenth centuries; but for all purposes of irrigation, drainage, and mining, the well, and its almost inseparable companion and assistant, the pump, is still in favour, and in our opinion will continue so to be, on account of its simplicity and efficiency. The most meritorious of our recent inventions, as far as its applicability to this class of undertaking is concerned, is that known as Bastier's Patent Pump, which for cheapness, efficiency, simplicity of construction, power and utility, considerably exceeds its competitors. Its mechanical arrangements are such that accidental breakage or derangement is rendered impossible. It is much more compact than the ordinary pump, and is remarkable for its lightness and durability. Besides, its power is so immense in proportion to its size that water can be raised from wells of the greatest possible depth, at the lowest minimum of cost, and can be worked either by means of steam or hand power. The results of the numerous experiments by which its capacity has been tested are that it utilises from 90 to 92 per cent. of the motive power as compared with other pumps now in use; that its price, and expense of erection, is three-fourths less than those in general use; that the depth from which the water is to be raised does not in the slightest degree interfere with or deteriorate from its general efficiency; that it performs the office of dredging most effectively, removing from the water channel all obstructive matters, such as stones, gravel, mud, wood, &c., without the slightest injury to the apparatus, and that its cleansing or removal is effected with the greatest facility. These qualifications speak so eloquently in favour of its universal patronage that our recommendation is scarcely needed. A still more conclusive argument, however, is furnished by the patentee himself, who proposes to contract for the erection of his pump at his own expense, and guarantee its perfect action for one year without repair, thus protecting the purchaser from any possibility of loss or disappointment from its use. To the agricultural, mining, and manufacturing interests this invention is of the highest importance, and we would earnestly urge upon them the advantages arising from its adoption, and apply for further information respecting its merits to the patentee's offices, 19, Manchester-buildings, Westminster, London.

A NEW LOCOMOTIVE STEAM-CARRIAGE, intended for running on ordinary roads, a few days since left the Buckingham Foundry, and conducted by the builder, Mr. T. Rickett, passed through Winslow, Aylesbury, and High Wycomb, to Windsor Castle, where its capabilities were displayed before the royal family, Prince Alfred, the Prince of Wales, the Earl of Caithness, and others, taking several trips with it, Her Majesty and the Prince Consort looking on. The Prince was much interested in the mechanism of the carriage, which he examined minutely, and Prince Alfred was delighted with the facility with which it was worked, traversing the ascents to the Castle, the various court-yards, &c., with the greatest ease. The carriage holds three persons, and is a very neat affair, weighing altogether about 10 cwts. It will run at any rate of speed up to 15 or 16 miles an hour, and can be stopped very quickly. We understand this is the first steam-carriage designed for high speed on common roads made by Mr. Rickett; several have been ordered for the Continent.

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